

REACHING HIGHER

Strategic Initiatives for Higher Education in Indiana

College Completion

Affordability

Preparation

Community College

→ **MAJOR RESEARCH
UNIVERSITIES**

Accountability

REACHING HIGHER WITH MAJOR RESEARCH UNIVERSITIES

Strengthening Indiana's Major Research Universities

June 13, 2008

Indiana Commission for Higher Education

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INDIANA COMMISSION
for
HIGHER EDUCATION

To thrive as a state and as individuals, all Hoosiers will need to achieve a depth and breadth of education never seen in the state's history. To meet this objective, the Indiana Commission for Higher Education developed and adopted *Reaching Higher: Strategic Initiatives for Higher Education in Indiana (2008)* in six key areas: College Completion, Affordability, Preparation, Community College, Major Research Universities and Accountability. These papers support the Commission's *Reaching Higher: Strategic Directions for Indiana (2007)* by outlining specific initiatives and recommendations for action.

OVERVIEW

The 2007 *Reaching Higher* vision statement outlines an aspiration:

“Providing every qualified Hoosier high school graduate with access to and the maximum potential for success through a high-quality postsecondary education ... [through] [p]roviding a broad range of educational alternatives ... that respond to the state’s needs for an educated workforce and other human capital. ...”

In addition, the 2007 *Reaching Higher* includes the following provisions related to major research universities:

Addressing Systemic Structural Issues

Purdue University West Lafayette and Indiana University Bloomington, encouraged by the Commission, should develop strategies for them to be among the top public research universities in the country for institutions with similar missions by reviewing peer comparisons, especially members of the Association of American Universities.

Why does Indiana need our major research universities to be among the best in the country and the world?

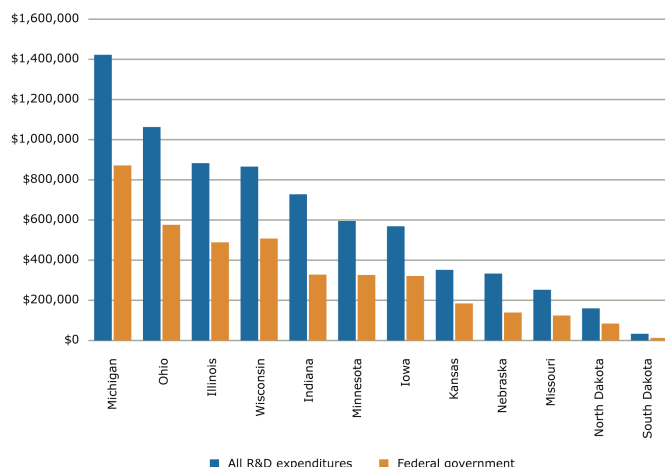
Major research universities are an integral part of a state’s higher education system.

Indiana’s system of higher education should include a broad range of quality postsecondary institutions, from two-year open-access institutions to baccalaureate-granting institutions with limited graduate and professional programs to research universities. A typical state system would consist of a pyramid of enrollment in which approximately one-half of students would enroll in two-year campuses; one-third of students would enroll in four-year, primarily baccalaureate-granting campuses with limited graduate and professional schools; and about 15 percent of students would enroll in major research campuses.

A broad range of postsecondary alternatives must necessarily include strong major research universities. Indiana University and Purdue University are both system institutions with regional campuses that focus on quality undergraduate education and service to community needs, and they are major research campuses, where the vast majority of the state’s research takes place and where students with demonstrated capacity pursue high levels of scientific or engineering education and research, particularly at the graduate level. It is duly noted that comments from both Indiana University and Purdue University stress the importance of cooperation and collaboration by and between our two major state-funded research institutions. It therefore makes sense to consider Indiana’s research capabilities not in terms of discrete geographical campus locations but as a **unified “research enterprise” with unique and complementary strengths** — perhaps as a research corridor from West Lafayette to Bloomington. This view of Indiana’s research potential not

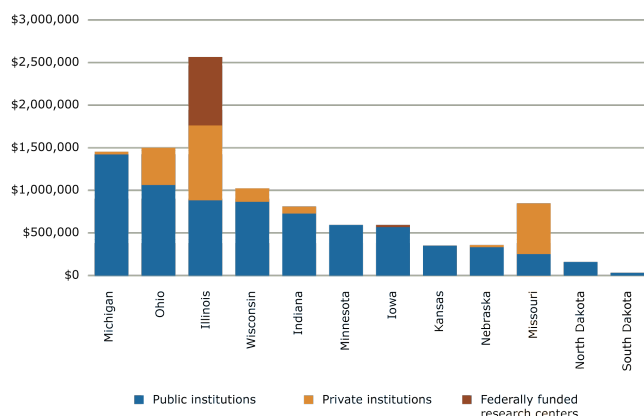
only could maximize Indiana's total resources by advancing a cooperative and collaborative approach to research but also could minimize redundant efforts and resource needs. It also recognizes the goal of advancing the state of Indiana in competition for scarce resources with other states by increasing and improving research efforts for the benefit of all of Indiana's residents.

**R&D Expenditures at Public Research Enterprise
MHEC States, FY2006 (\$000)**



In the context of peer evaluations, the term “major research universities,” for purposes of this white paper, refers to universities in the United States that are classified as “research universities with high and very high research activity” by the Carnegie Foundation for the Advancement of Teaching classification system. The three campuses with these designations are Purdue University West Lafayette and Indiana University Bloomington (both ranked very high), as well as Indiana University-Purdue University at Indianapolis (IUPUI) (ranked high primarily because of the School of Medicine). The fact that IUPUI is unique in its organization, is operated by Indiana University in partnership with Purdue University and is located in the transportation corridor in a point equidistant from the other two major research campuses gives Indiana a special advantage in advancing the type of interdisciplinary and intercampus work that will likely be associated with the most successful university research activities in the future.

**All R&D Expenditures by Institutional Sector
for MHEC States, FY2006 (\$000)**



Strong research universities provide Indiana an advantage in global competition for the best students and faculty and provide opportunity for highly qualified students and faculty to maximize educational and research opportunities.

Major research universities within the state provide the maximum opportunity for success for high-ability students seeking to study with top researchers and pursue livelihoods in science and engineering, medicine and health sciences, and information and technology, particularly for graduate education. Strong research universities are magnets for talented, high-performing students, faculty and knowledge workers. It is vital to maintain and build Indiana's research campuses as pipelines for students and graduates who have studied under top research faculty and are well prepared to be innovators and discoverers. These students are attractive to a state's economy because of their outstanding educational experience and credentials.

Major research universities create economic opportunity and growth.

Major research universities are the major drivers of innovation for advancing engineering, technology, medicine and intellectual property. Since World War II, the major American research universities have been the primary source of research and development activities in this country. And though direct links between this research activity and its impact on the American economy have been difficult to quantify, there is general agreement among policymakers that major research and development activities play a substantial role in economic development. High-quality major research universities are vital to the ability of Indiana's students and its economy to compete in the national and global marketplace for ideas, resources and opportunities.

A high concentration of strategically focused researchers and research activity in a system of higher education is vital to fostering a critical mass of human, financial and physical resources for maximum effectiveness in research and competitiveness in bidding for scarce federal and private research funding. The fruits of strong major universities — talented graduates, new breakthroughs and products, new businesses — can foster even more livable communities filled with the creative class of Hoosier innovators who will drive the knowledge-based economy.

Indiana University and Purdue University must make the case.

The strategic plans of Indiana University and Purdue University must make the case why Indiana needs our major research universities to be among the best.

What does it mean to be among the best major research universities in the country and the world?

Strategic plans of Indiana University and Purdue University

It is absolutely vital that the institutions embrace the *2007 Reaching Higher* goal of being among the best major research universities in the country and the world. Though the Commission and the state certainly have key roles to play in assisting and encouraging the development of our major research campuses, the institutions must ultimately advance themselves. Both Indiana University and Purdue University have inaugurated new presidents in the past year. Both institutions are currently in the process of designing new strategic plans. **The Commission encourages Indiana University and Purdue University to develop strategies in their strategic plans** toward being among the best major research universities.

Identifying appropriate peer institutions

The Commission encourages the institutions to select their own peers, in the context of their strategic plans, against which to measure their progress. The Commission also reserves the right to identify peers if the necessity arises. Peer groups can be identified from the very broad to a specific handful of relevant comparable and aspirational peers. When the Commission refers to “major research universities,” it refers to the definition provided by the Carnegie Foundation for the Advancement of Teaching’s *Carnegie Classification of Institutions of Higher Education*: research universities with high and very high research activity. Specific language in the *2007 Reaching Higher* also references the Association of American Universities (AAU).

The peers currently identified by Indiana University Bloomington and Purdue University West Lafayette are listed on the next page. It should be noted that these peer lists are subject to change as the new strategic plans are developed by the institutions.

PEERS SELECTED BY INDIANA UNIVERSITY BLOOMINGTON	PEERS SELECTED BY PURDUE UNIVERSITY WEST LAFAYETTE
Michigan State University	Cornell University
Ohio State University	Georgia Institute of Technology
University of Kansas	University of California, Davis
Purdue University West Lafayette	Texas A&M University — College Station
University of Colorado	University of Arizona, Tucson
Pennsylvania State University	Pennsylvania State University — University Park
University of California, Berkeley	University of California, Berkeley
University of Illinois at Urbana	University of Illinois at Urbana
University of Michigan — Ann Arbor	University of Michigan — Ann Arbor
University of Texas at Austin	University of Texas at Austin
University of Wisconsin — Madison	University of Wisconsin — Madison

Use of external campus and state rankings

It is important that **the Commission and the institutions be able to identify some external method of evaluating the status and progress of developing** toward being one of the top major research universities. In addition, external rankings have a fair amount of currency in the public eye (particularly as students make college application choices) and, in some cases, the academic community as well. The Commission has identified three external rankings and has put them forth for public discussion. It is not intended at this time that these ranking are absolutely the rankings to be used by the Commission in these efforts. The Commission is open to adding or removing rankings or drawing only from certain metrics. Those rankings are:

- “The Top American Universities,” The Center for Measuring University Performance (2006)
- “Shanghai Academic Ranking of World Universities,” Institute of Higher Education, Shanghai Jiao Tong University (2005)
- “America’s Best Colleges 2008,” *U.S. News and World Report*

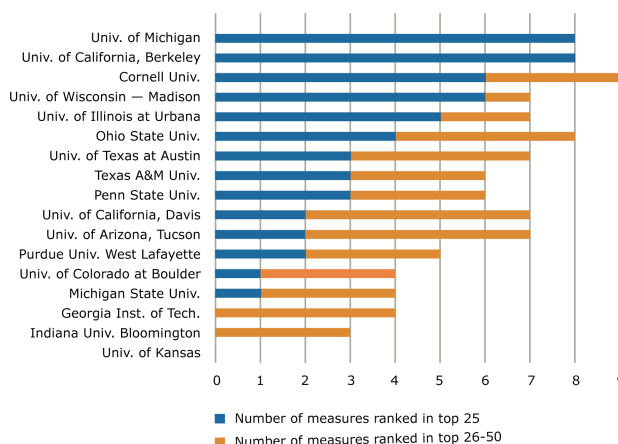
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Strategic Initiatives for Higher Education in Indiana

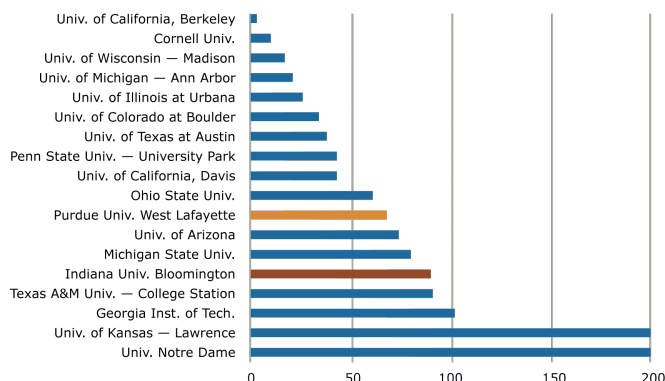
These rankings were chosen because they are well known to the academic community, the general public or both. They also are published in a consistent and accessible fashion. These rankings include a wide range of metrics with very little overlap between the three, ranging from undergraduate student academic qualifications to research and development expenditures to faculty productivity and recognition.

It is the intention of the Commission that these rankings be monitored with the goal of moving our major research universities to higher levels in the rankings. The most recent results from the three external rankings are shown below with the selected peer group for both Indiana University Bloomington and Purdue University West Lafayette.

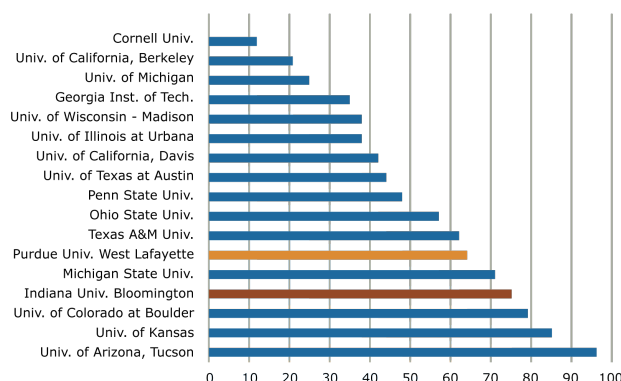
**The Top American Universities,
The Center for Measuring University Performance (2006)**



**Shanghai Academic Ranking of World Universities,
Institute of Higher Education, Shanghai Jiao Tong University (2005)**



**America's Best Colleges 2008,
U.S. News and World Report Rankings**



Identifying, analyzing and monitoring appropriate metrics

As with the 2007 *Reaching Higher* component on accountability, **identifying, analyzing and monitoring appropriate metrics are essential to the major research university plan.** Of course, the major research campuses will participate in the metrics advanced in the accountability plan of the 2007 *Reaching Higher*. In addition, metrics unique to major research universities must be identified.

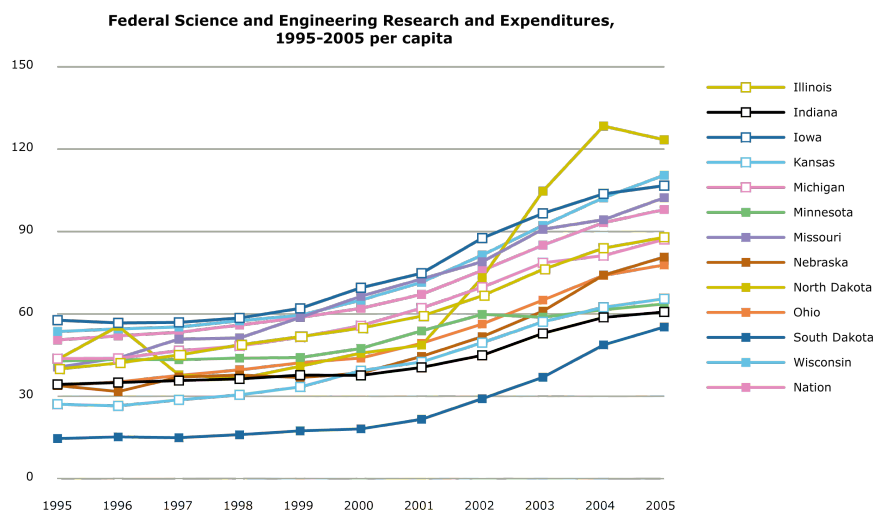
Basic metrics

A starting place for these major research university metrics should come from the identified external rankings. In addition, the AAU keeps a list of metrics the members use for self-evaluation. It should be noted that the Commission fully understands that each individual metric from the external rankings and the AAU may have more or less relevance for our purposes. Therefore, each individual metric should be scrutinized for its value. Some of the metrics these rankings have in common include the amount of federal and total research funding, faculty awards, academic qualifications of entering students, and doctorates awarded.

Research activity metrics

Consistent with the language of the 2007 *Reaching Higher*, the Commission expects to measure both statewide and individual campus progress on research activity, primarily measured in research and development expenditures from federal and other revenue sources. Specifically, **Indiana should be among the top Midwestern states in both total and federal research and development expenditures per capita by 2012.**

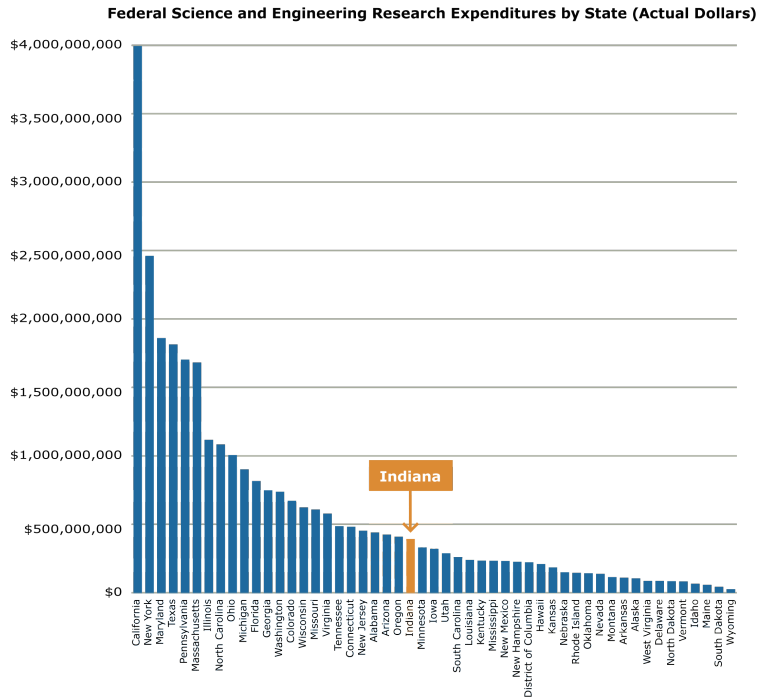
Metrics measuring the amount of research and development expenditures from federal and other sources should be monitored by Indiana University Bloomington, Purdue University West Lafayette and IUPUI. It is duly noted that this may cause some data issues due to differences in reporting methodologies.



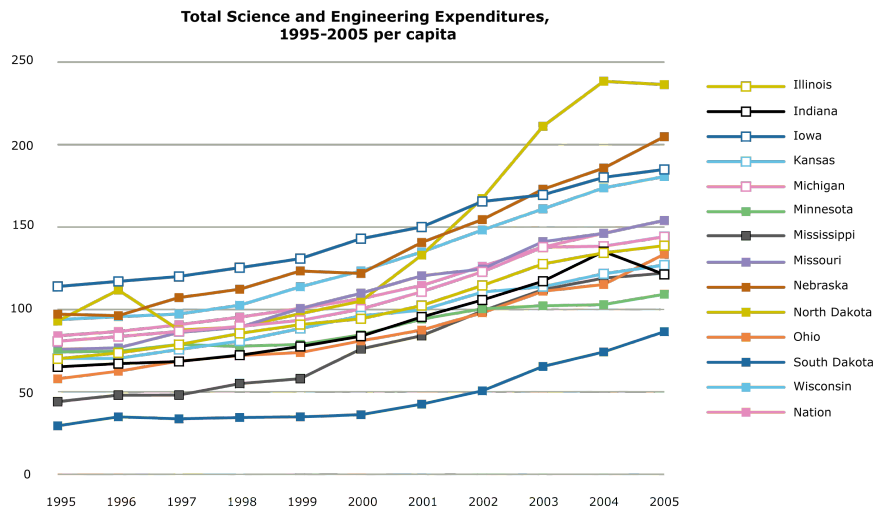
Source: National Science Foundation, www.nsf.gov; U.S. Census Bureau, Summary File 1, Population Estimates: www.census.gov.

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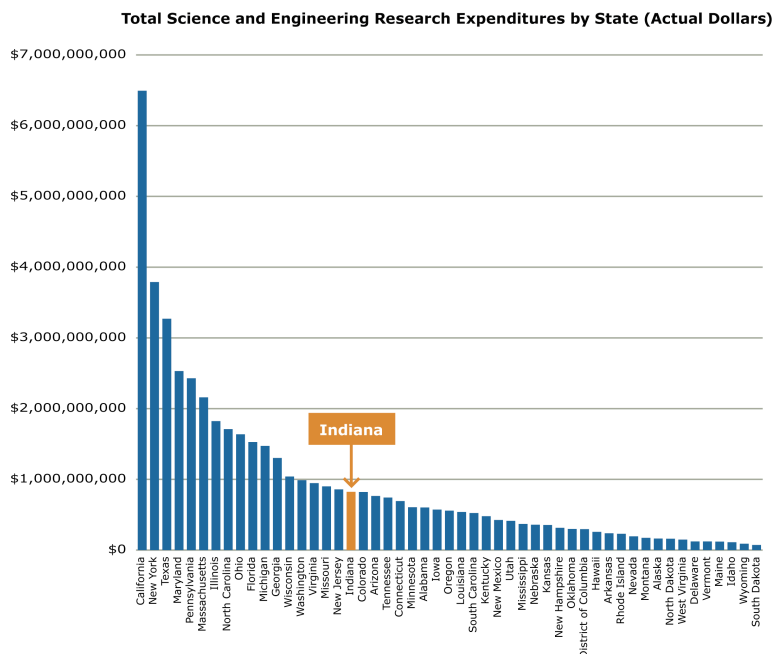
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Source: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, FY2006.



Source: National Science Foundation, www.nsf.gov, U.S. Census Bureau, Summary File 1, Population Estimates: www.census.gov.



Source: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, FY2006.

Economic development metrics

Major research universities argue, and policymakers agree, that the major research universities of a state play a substantial role in the economic fortunes of that state. Though the research on the connection between major research activity and economic well-being and growth is somewhat lacking in direct, quantifiable empirical evidence, there is a wealth of data and anecdotal evidence showing a clear correlation between research activity at major research universities and healthy economic activity.

The Commission, Indiana University, Purdue University and other relevant actors should cooperatively identify, analyze and monitor appropriate metrics related to economic development. Metrics, among others, should include:

- Invention Disclosures
- Active Patents
- Licensing Income
- Jobs and Wages Data
- New Economy Index
- Start-Up Companies
- Business Assistance

State of Indiana metrics

It is recognized that research institutions operate in a sophisticated and interconnected global research and development enterprise and not in a vacuum. **Indiana should identify peer states and develop metrics that allow it to measure itself against other states competing for** scarce human and resource capital. The Indiana Commission for Higher Education (ICHE) should work with Indiana University, Purdue University, the Indiana Economic Development Corporation and other relevant state and private-sector organizations to help develop a “Research and Development Scorecard” that would assist in aligning Indiana’s economic development goals with institutional practices and state resource allocation and incentives. Several existing national reports that might be a basis for the scorecard include the State New Economy Index, the State Technology and Science Index, and the Alliance for Science and Technology Research in America.

How do we move our major research universities up among their peers to become among the best in the country and the world?

Purdue University West Lafayette and Indiana University Bloomington, encouraged by the Commission, should develop strategies to become among the top public research universities in the country for institutions with similar missions by reviewing peer comparison.

Identifying strategies to improve on specific metrics and advance the research campuses

1. Expand existing state funding incentives for research.

Having identified one metric as being among the top Midwestern states in total and federally sponsored research, **Indiana should continue and, as appropriate, expand the state funding incentive for its major research universities** to increase research dollars for science and engineering coming into the state. The Commission will develop a proposed funding mechanism by the end of 2008.

2. Improve availability and flexibility of funds to match research grants.

As the amount of federal funding for science and engineering research has slowed in recent years, and as the amount of research space has proliferated on university campuses around the country, major research universities competing for sponsored research funding are asked to put more matching funds into proposals for federal and other research funding. Since the state’s formula for research matching funds rewards our institutions in arrears (meaning that the matching funds come after an increase in research expenditures has already been made), those funds are not available up front for matching grants.

It is proposed that a fund be created for which researchers from Indiana University Bloomington, Purdue University West Lafayette and IUPUI could compete to use as matching funds to leverage federal and

private research grants. Such a fund may consist of state appropriations, institutional funds and private funds. Consistent with the *2007 Reaching Higher* goal of ensuring that Indiana's major research universities are among the best and are advancing Indiana's economy, these funds should be focused in areas related to the life and physical sciences and engineering. It is not intended that these funds be strictly limited to specific departments or disciplines, but it is necessary that they be focused on the areas of science and technology that most benefit the state and the institutions as determined by a panel of reviewers including institutional peers and representatives from state government and the private sector. It is fully expected that the institutions shall partner with each other, other public and private postsecondary institutions from within and outside of Indiana, and industry partners whenever appropriate.

A potential model for this fund could be the Industry-University Cooperative Research Program in California. That program provides \$60 million per year for peer-reviewed, competitively awarded research grants and is funded approximately 40 percent from state funds, 10 percent from university funds and 50 percent from private-sector funds. It is noted that the 2007 General Assembly did appropriate \$20 million to the Indiana Economic Development Corporation for the purpose of providing funds to recruit and retain research faculty for the Indiana University School of Medicine and for Purdue University's program for researchers in the life sciences. In addition, the state has appropriated funds to the 21st Century Research and Technology Fund in past years. The institutions argue that these current funds carry too-restrictive state controls and argue for a fund with less state control for greater speed and flexibility in grant proposals. The Commission would prefer that if state funds were appropriated to this fund, that the state be represented in a review panel.

3. Improve the undergraduate preparedness and qualifications of students entering Indiana University Bloomington and Purdue University West Lafayette.

Major research university campuses offer maximum opportunity for high-ability students seeking to study with top researchers and pursue livelihoods in science and engineering, medicine and health sciences, and information technology, particularly for graduate education. In addition, high-ability students have a better opportunity to learn from top researchers, and top researchers can benefit from high-ability student researchers. Moreover, the link between high-ability student researchers, faculty researchers and research done with or for the benefit of Indiana business and industry can only help to strengthen the opportunities for Indiana's high-ability graduates to stay in Indiana after graduation. As such, Indiana University Bloomington and Purdue University West Lafayette should have high academic standards for its undergraduate student body.

Indiana University Bloomington and Purdue University West Lafayette should increase the academic qualifications necessary for undergraduate acceptance. However, the new academic standards should be clearly defined and publicized well in advance of their implementation so students have appropriate notice and opportunity to meet those higher standards. The Commission recommends that beginning with the fall semester 2013, the standard to be admitted to Indiana University Bloomington and Purdue University West Lafayette should be Core 40 Academic Honors.

It is vital that in the process of increasing the academic standards for undergraduate students at major research campuses, programs and policies be developed by the institutions and the state to ensure that a diverse student body be maintained and even improved. The strategies must start in the student pipeline before students are college age and therefore requires cooperative programs with K-12, outreach programs and concerted recruitment programs. The affordability focus within the *2007 Reaching Higher* also addresses this issue to some extent.

4. Explore funding for rapid transformation of Indiana’s major research universities.

Last biennium, Indiana University proposed a life science initiative that requested a substantial financial commitment from the state well above historical biennial appropriation increases. In addition, Governor Daniels proposed that \$1 billion (based on projected revenues from the potential franchising of the Indiana lottery) be spent on higher education in the form of student scholarships and funding for research activities. Indiana University and Purdue University have made an argument that our major research universities cannot transform themselves fast enough or adequately with the same or similar revenue streams that have been historically accruing to Indiana’s higher education system. Therefore, it is argued, a large and timely infusion of resources is necessary to move Indiana’s institutions in any substantial way. This transformative infusion of resources could create a critical mass of resources and a “research excitement” that could help increase the research culture in Indiana and help attract new financial and human resources necessary to develop our campuses into top major research universities.

5. Indiana University and Purdue University should develop strategies to attract and retain top research faculty.

The 2007 General Assembly appropriated \$20,000,000 “to support the recruitment and retention of world-class scientists specializing in life sciences” for the Indiana University School of Medicine and Purdue University. Indiana should consider similar appropriations in future biennia. Indiana University and Purdue University should organize and prioritize their fundraising efforts to include raising funds for faculty endowments aimed at recruiting and retaining top researchers. Capital planning, particularly for science laboratories, should include faculty recruitment and retention efforts. Capital project requests for new construction and special repair and rehabilitation projects from Indiana University and Purdue University should prioritize, when appropriate, to account for faculty recruitment and retention issues. The ability and flexibility of Indiana University and Purdue University to renovate and equip capital facilities for the purpose of supporting, retaining and recruiting top research faculty may be improved through changes in the statutory review process. Best practices in other states should be examined for strategies.

6. Examine research capacity of Indiana University and Purdue University.

National Science Foundation (NSF) data suggest that Indiana University and Purdue University own and operate less research space than many of their peer institutions. Obviously, the amount of research space has some direct correlation to the amount of sponsored research. The same data suggest that compared to their peers, Indiana University and Purdue University generate higher research dollars per square foot of

research space than most of their peers. However, NSF data also show a marked increase in the amount of research space at major research university campuses around the country in the past 10 years. With the slowing of research dollars coming from the federal government in the past few years, it is not a given that more research space would necessarily lead to more federally sponsored research. In addition, Indiana University Bloomington, IUPUI and Purdue University West Lafayette have added, or are in the process of adding, substantial research space to all three campuses. Indiana University and Purdue University should examine very carefully the amount of research space on their campuses, and if there is a substantial and calculated likelihood that increased research space would lead to additional sponsored research without decreasing the amount of sponsored research per square foot, they should pursue funding for new research space from indirect cost-recovery, private, federal and state sources.

7. Engage research faculty in ways that encourage growth in sponsored research.

Purdue University is discussing an “agency strategy” where research faculty become engaged in federal agencies to take a more proactive approach to procuring federal research grants rather than passively waiting for proposals to be submitted to apply for grants. This is a strategy that could be implemented statewide. In addition, a more focused approach to attracting foundation grants could pay dividends in private sponsored research.

8. Promote collaboration between Indiana University and Purdue University to attract funding.

Indiana University and Purdue University should cooperate when possible to maximize opportunity to attract additional research funding to the state. ICHE should consider appropriate incentives to reward collaborative research efforts between Indiana University and Purdue University.

9. Encourage Indiana University and Purdue University to attract more corporate/private-sector participation in research endeavors.

Purdue University recently entered into an agreement with the Mann Foundation for Biomedical Engineering that could act as a model for corporate partnerships. Indiana University and Purdue University should work to both maximize the existing strengths of the Indiana economy and look to develop a new “geographic home” in Indiana for niche research areas, particularly areas where Indiana already has strengths, such as engineering, agriculture, medicine and health sciences, and nanotechnology. Joint research funds with state, federal, corporate/industry and internal institutions, as well as other public and private postsecondary educational institutions, would encourage this result.

- 10. Collaboratively develop an innovation agenda for Indiana among Indiana University, Purdue University, ICHE, the Indiana Economic Development Corporation and private-sector advocates.**

A small group of Indiana University and Purdue University administrators have been meeting to develop a multisector plan for strengthening the university-based research arm of Indiana's research and development enterprise. This group is examining other state models, including the states of California, Georgia and Michigan. This group could be used to develop a plan that recognizes university-based research as an asset to help create a climate for research and development in Indiana; encourage collaboration across the various economic, corporate, governmental, philanthropic and university sectors; and incentivize and leverage research and development investment.

- 11. Coordinate all research sectors to work with Indiana's federal congressional delegation to pursue federal research funding.**
- 12. Investigate the possibility of bringing a federally funded research and development center to Indiana under the joint administration of Indiana University and Purdue University.**

SUMMARY

1. **Why does Indiana need our major research universities to be among the best in the country and the world?**
 - Major research universities are an **integral part of a state's higher education system**.
 - Major research universities **maximize the educational opportunities for highly qualified students** to study under top researchers and prepare for livelihoods in the areas of science and engineering, medicine and health sciences, information technology, and the arts, particularly for graduate education.
 - Major research universities are the **major drivers of innovation** for advancing engineering, technology, medicine and intellectual property and as such play a vital role in Indiana's economy.
 - The strategic plans of Indiana University and Purdue University **must make the case**.

2. **What does it mean to be among the best major research universities in the country and the world?**
 - This must be **identified in the strategic plans** of Indiana University and Purdue University.
 - Appropriate **peer institutions** must be identified and monitored.
 - **External rankings** provide objective information on comparisons.
 - **Appropriate metrics** must be identified, analyzed and monitored.
 - **State metrics** should be developed to track Indiana's commitment and progress.

3. **How do we move our major research universities up among our peers to become among the best in the country and the world?**
 - The Commission encourages Indiana University and Purdue University to **develop specific strategies**.
 - Identify strategies to improve on specific metrics:
 - Expand existing state funding incentives for research;
 - Improve availability and flexibility of funds to **match research grants**;
 - Improve the **undergraduate preparedness and qualifications** of students entering Indiana University Bloomington and Purdue University West Lafayette;
 - Explore **funding for rapid transformation** of Indiana's major research universities;
 - Indiana University and Purdue University should develop strategies to **attract and retain top research faculty**;
 - Examine **research capacity** needs at Indiana University and Purdue University;
 - Engage research faculty in ways that encourage **growth in sponsored research**;
 - Promote **collaboration between Indiana University and Purdue University** to attract funding;
 - Encourage Indiana University and Purdue University to attract more **corporate/private-sector participation** in research endeavors;
 - **Collaboratively develop an innovation agenda for Indiana** among Indiana University, Purdue University, ICHE, the Indiana Economic Development Corporation and private-sector advocates;
 - **Coordinate all research** sectors to work with Indiana's **federal congressional delegation** to pursue federal research funding; and
 - Investigate the possibility of bringing a **federally funded research and development center** to Indiana under the joint administration of Indiana University and Purdue University.